

Remarks

Entry of the amendments, reconsideration of the application, as amended, and allowance of all pending claims are respectfully requested. Claims 1-45 remain pending.

In accordance with 37 C.F.R. 1.121(b)(1)(iii) and 37 C.F.R. 1.121(c)(1)(ii), marked-up versions of the amended title and amended claims, respectively, are provided on one or more pages separate from the amendment. These pages are appended at the end of the Response.

In the Office Action, restriction to one of the following inventions was required under 35 U.S.C. 121:

- I. Claims 1, 2, 9-11, 16, 17, 24-26, 31, 32 and 39-41, drawn to bypassing the use of buffers to transmit data onto a transmission medium, classified in class 709, subclass 250.
- II. Claims 3-6, 12, 13, 18-21, 27, 28, 33-36, 42 and 43, drawn to swapping buffers or pointers to data between the file system and the sender, classified in class 710, subclass 52.
- III. Claims 7, 8, 14, 15, 22, 23, 29, 30, 37, 38, 44 and 45, drawn to translating data in buffers, classified in class 709, subclass 246.

As provisionally elected by Blanche Schiller during a telephone conference on September 6, 2002, applicant's provisional election of Group I, claims 1, 2, 9-11, 16, 17, 24-26, 31, 32 and 39-41 is hereby confirmed. However, applicant respectfully traverses the restriction requirement for the following reasons.

Applicant notes that Group II claims, 3-6, 18-21 & 33-36, and Group III claims 7-8, 22-23 & 37-38 ultimately depend from independent claims 1, 16 or 31, which are classified as Group I claims. Since the amended Group I claims presented herewith are believed allowable for the reasons discussed below, allowance of these claims is also requested.

Further, applicant respectfully submits that a proper restriction requirement requires there to be a burden on the Patent Office to examine the claims together. If there is no burden, then restriction, regardless of the content of the claims, is not proper. (See M.P.E.P. §803.) In this case, the Examiner has evidenced the burden upon the Office by classifying the claims of the inventions in different subclasses. However, applicant respectfully submits that the subject matter recited in the Group II and Group III claims is closely related to that recited in the Group I claims. In fact, applicant submits that a complete search of one of these inventions should entail examination of the other referenced class and subclasses. Thus, because of the closeness of the subject matter, and the probable overlapping searches, applicant respectfully submits that there would be little additional burden on the Examiner to examine the remaining Group II and Group III claims in one application with the provisionally elected claims. Accordingly, applicant requests reconsideration and withdrawal of the outstanding restriction requirement. In accordance with the title objection in the Office Action, a new title is presented herewith for the Examiner's approval.

Substantively, applicant makes a bona fide attempt to advance prosecution of this application through the amendments to independent claims 1, 16 & 31 presented herewith. However, no admission is made by these amendments as to the propriety of the outstanding obviousness rejection against the originally stated independent claims. Support for the claim amendments is found throughout applicant's specification and in particular at page 13, lines 1-2; page 25, lines 24-27 ("server" in place of "computing unit"); page 13, lines 13-16; page 21, lines 4-7; page 25, lines 24-26 ("transmitting being responsive to a request for transmission received by the server"); page 8, lines 13-24 ("reducing data movement in said server"); and page 38, lines 9-11; inquiry 330 and the preceding steps of FIG. 3b ("said buffers being bypassed irrespective of the server having knowledge of the request prior to receipt thereof"). Thus, no new matter is believed added to the application by any claim amendment presented.

In the Office Action dated October 4, 2002, claims 1-2, 9-11, 16-17, 24-26, 31-32 and 39-41 were rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art in the background in view of Ledain et al. (U.S. Patent No. 6,021,408; hereinafter, "Ledain") and Hamilton et al. (U.S. Patent No. 5,799,150; hereinafter, "Hamilton"). Applicant

respectfully, but most strenuously, traverses this rejection to any extent deemed applicable to the amended claims presented herewith.

An “obviousness” determination requires an evaluation of whether the prior art taken as a whole would suggest the claimed invention taken as a whole to one of ordinary skill in the art. In evaluating claimed subject matter as a whole, the Federal Circuit has expressly mandated that functional claim language be considered in evaluating a claim relative to the prior art. Applicant respectfully submits that the application of these standards to the independent claims of the present invention leads to the conclusion that the recited subject matter would not have been obvious to one of ordinary skill in the art based on the applied patents.

Applicant recites a technique for reducing data movement within a computing environment (e.g., claim 1, as amended herein) that includes transmitting data between a file system of a server of the computing environment and a transmission medium of the computing environment. The transmitting data is in response to a request for transmission received by the server. The data transmission further includes reducing data movement in the server by bypassing non-file system buffers of the server in performing the transmission. These buffers are bypassed irrespective of the server having knowledge of the request prior to the request’s receipt.

Applicant’s invention thus includes, in part, reducing data movement in the server, bypassing buffers of the server that are not file system buffers, and bypassing such buffers to reduce data movement regardless of whether the server has advance knowledge of a server-received request for data transmission. Applicant respectfully submits that at least some of these features of the claimed invention are not taught, suggested or implied by applicant’s admitted prior art, Hamilton, or Ledain, alone or in combination.

Applicant’s Background Art describes a Distributed File Services (DFS) system, in which data is moved from one set of buffers within the server to another set of buffers within the server. These data movements increase processing time at the server, thereby negatively affecting response time of requests (e.g., read and write requests) (see applicant’s specification at page 2,

lines 12-19). At paragraph 11 on page 4 of the Office Action, it is stated that applicant's Background Art does not teach bypassing non-file system buffers. Applicant respectfully submits that the Background Art also does not teach or suggest a technique for reducing data movement in a server by bypassing non-file system buffers, or for bypassing such buffers irrespective of the server having advance knowledge of a request to transmit data received by the server, as presently claimed. These features lacking in the Background Art are also not taught, suggested or implied in Hamilton or Ledain.

Hamilton describes a distributed multimedia system which enables real-time transmission of broadcast quality media data over a network (col. 3, lines 38-40 thereof). Prior to a server receiving a client's request to read media data, the Hamilton technique creates and populates a TrackList data structure residing on the server to store the media data that the client will need (col. 6, lines 32-36; col. 7, lines 6-10). The TrackList also allows the server to perform read ahead operations to satisfy subsequent read requests (col. 7, lines 21-28). Processing these read requests results in, for example, audio/video playback wherein data is transmitted directly to "userlevel" memory buffers of the client (col. 6, lines 5-7; col. 10, lines 3-6). This is very different from applicant's invention, which recites, in part, data transmission that bypasses non-file system buffers of a server, irrespective of the server having prior knowledge of the request for data transmission. Hamilton's playback data transmission results from the server using the predictive information of the TrackList to perform read aheads to satisfy current and subsequent client read requests (col. 7, lines 19-28). Thus, Hamilton relies on the server having advance knowledge of a client's read request. For the reasons stated above, applicant respectfully submits that Hamilton does not teach, suggest or imply bypassing of buffers irrespective of the server having prior knowledge the data transmission request.

Further, as stated above, Hamilton fails to teach, suggest or imply bypassing non-file system buffers of a server. When the Hamilton technique directly transmits media data to a userlevel memory buffer, it bypasses copying media data to system memory buffers (col. 6, lines 3-7; col. 9, lines 57-67). However, this buffer bypass is quite different from the bypassing of buffers recited in the present invention. In Hamilton, the bypassed system memory buffers reside on the client side (col. 6, lines 6-7). In contrast, the bypassed non-file system buffers of

applicant's claimed invention reside on the server (see, e.g., claim 1). Moreover, since the buffer bypassing in Hamilton occurs at the client, the resulting data movement reduction is also limited to the client side (Abstract; col. 6, lines 3-7). Applicant's invention, on the other hand, recites reducing data movement in the server.

In the Office Action, col. 9, lines 59-67 and col. 10, lines 34-39 are cited as teaching bypassing system buffers. Applicant respectfully submits that the cited section in column 10 does not mention system buffers, let alone bypassing them. Instead, this section describes avoiding copying large media files from the server to the client, and circumventing the need for each client to use local disk space to hold copies of media files. The referenced section in column 9 does discuss bypassing system memory buffers, but the discussion immediately following indicates that these buffers are bypassed in the client (see col. 10, lines 3-6 and FIG. 7 of Hamilton). Thus, this section of Hamilton does not teach or suggest bypassing non-file system buffers of a server, as recited by the claims presented herewith.

To summarize, Hamilton does not teach, suggest or imply bypassing buffers irrespective of a server having advance knowledge of a data transmission request, bypassing non-file system buffers of a server, nor bypassing such buffers to reduce data movement within a server. Thus, since Hamilton fails to describe or suggest multiple aspects of applicant's invention as claimed herein, Hamilton does not render applicant's invention obvious, alone or in combination with the other applied art.

Ledain describes a log-structured file system including a disk with the main file system and multiple log disks. File write operations store file and system data to the log disks rather than to the main file system. A control program in Ledain manages the migration of the previously written data from the log disks to the main file system (see Abstract and col. 5, lines 36-61 thereof). Thus, Ledain's technique improves file writing speed at the expense of extra disk space. Applicant respectfully submits that Ledain's subject matter is quite different from the present invention's. For example, the technique of Ledain is directed to avoiding writing to a file system disk, while the applicant's invention avoids data movement in a server. More particularly, Ledain addresses log devices in a file system without any need for a server receiving

requests (see, e.g., FIGs. 1-3). Since Ledain's file system is silent as to a server receiving data transmission requests, it follows that Ledain is also silent as to teaching, or even suggesting, that a server's prior knowledge of such a request (or lack thereof) is relevant to any action, let alone the bypassing of non-file system buffers. Thus, applicant respectfully submits that Ledain does not teach or suggest buffers being bypassed irrespective of a server having advance knowledge of a data transmission request, as claimed by the present invention. Further, Ledain does not describe or suggest bypassing non-file system buffers of a server, nor bypassing such buffers for the purpose of reducing data movement in the server.

The Office Action cites col. 3, lines 18-19 of Ledain as teaching buffer bypassing in a file system. Applicant notes that this section of Ledain is only a statement of the conventional practice of writing files directly to disk cache rather than to memory cache, and is therefore not a teaching, per se, of buffer bypassing. Further, applicant respectfully submits that the cited bypassed memory cache is a file system buffer. Thus, this section of Ledain does not describe or suggest bypassing a non-file system buffer, as claimed by the present invention. The Office Action also cites col. 12, lines 38-44 as teaching buffer bypassing in a file system. This section of Ledain describes that a function call may specify options to bypass processing data by the log device. Applicant respectfully submits that this bypassing is concerned with function calling and thus, is not directed to buffers, nor to bypassing non-file system buffers to reduce data movement in a server, as claimed by the present invention. The Office Action's reference to col. 2, lines 12-13 of Ledain is only a statement that some file system network protocols require that file data be written immediately to disk rather than to memory. Applicant respectfully submits that this section of Ledain does not describe or suggest reduction of data movement by bypassing non-file system buffers, as recited by applicant.

Since applicant's stated prior art, and the Hamilton and Ledain patents each fail to teach or suggest multiple features of applicant's claimed invention, the combination thereof also fails to teach or suggest multiple aspects of applicant's claimed invention.

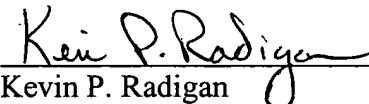
For the above reasons, applicant respectfully submits that independent claims 1, 16 & 31 recite patentable subject matter. The dependent claims at issue are believed patentable for the

same reasons as the independent claims from which they directly or ultimately depend, as well as for their own additional features.

For example, claim 9 further recites that the transmitting includes sending data from the file system over the transmission medium to a receiver of the data. The Office Action cites Hamilton, col. 8, lines 1-3, as teaching sending data to a receiver. Applicant respectfully submits that this section of Hamilton addresses the receiving of data (i.e., the bytes being read by the client), but not the portion of data transmission that includes sending over the wire. As another example, claim 10, which depends from claim 9, further recites that the sending includes using a routine identified by the receiver to send the data, wherein the routine is provided one or more pointers to the data to be sent to the receiver. Thus, applicant's invention passes function pointers so that data may be transmitted directly from file system buffers while bypassing non-file system buffers. Applicant respectfully submits that a careful reading of Hamilton, including the portions referenced in the Office Action relative to claim 10 (i.e., col. 8, lines 39-43 and col. 7, lines 51-52), reveals no description or suggestion of passing pointers to sent data for the purpose of bypassing non-file system buffers. Thus, for the reasons stated above, applicant respectfully submits that the dependent claims presented herewith patentably distinguish over the applied art.

Should the Examiner wish to discuss this case with applicant's attorney, the Examiner is invited to contact applicant's undersigned representative at the below-listed number.

Respectfully submitted,



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Version with markings to show changes made

In the Title:

On pages 1 and 57, the title has been amended, as follows:

METHOD, SYSTEM AND PROGRAM PRODUCTS FOR REDUCING
DATA MOVEMENT WITHIN A COMPUTING ENVIRONMENT BY
BYPASSING NON-FILE SYSTEM BUFFERS

In the Claims:

Claims 1, 16 & 31 have been amended, as set forth below:

1. (AMENDED) A method of reducing data movement within a computing environment, said method comprising:

transmitting data between a file system of a server [computing unit] of said computing environment and a transmission medium of said computing environment, said transmitting being responsive to a request for transmission received by the server; and

wherein said transmitting comprises reducing data-movement in said server by bypassing non-file system buffers of said server [computing unit] in performing the transmission, said buffers being bypassed irrespective of the server having knowledge of the request prior to receipt thereof.

16. (AMENDED) A system of reducing data movement within a computing environment, said system comprising:

means for transmitting data between a file system of a server [computing unit] of said computing environment and a transmission medium of said computing environment,

said transmitting being responsive to a request for transmission received by the server;
and

wherein said means for transmitting comprises means for reducing data movement in said server by bypassing non-file system buffers of said server [computing unit] in performing the transmission, said buffers being bypassed irrespective of the server having knowledge of the request prior to receipt thereof.

31. (AMENDED) At least one program storage device readable by a machine, tangibly embodying at least one program of instructions executable by the machine to perform a method of reducing data movement within a computing environment, said method comprising:

transmitting data between a file system of a server [computing unit] of said computing environment and a transmission medium of said computing environment, said transmitting being responsive to a request for transmission received by the server; and

wherein said transmitting comprises bypassing non-file system buffers of said server [computing unit] in performing the transmission, said buffers being bypassed irrespective of the server having knowledge of the request prior to receipt thereof.